Maladaptive Coping Strategies in Patients with Bruxism Compared to Non-Bruxing Controls

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Background: *Sleep bruxism is the non-functional grinding or clenching of teeth during sleep. It may lead to tooth damage and myofascial pain. Although stress is discussed as a main causal agent, there is a lack of studies concerning coping strategies in patients with sleep bruxism.* Purpose: *The aim of the present study was to investigate whether bruxers, compared to non-bruxing individuals, apply maladaptive coping strategies.* Method: *Seventy-five sleep bruxers and 38 non-bruxers were selected by dental examination and tested by a German coping questionnaire (SVF78).* Results: *A significant difference in positive coping strategies was observed between the two groups. Bruxers reported less positive coping strategies, mainly less "reaction control" and "positive self-instructions." In general, males reported less negative coping strategies.* Conclusion: *The reported effects demonstrate a deficit of functional coping strategies in bruxers, whereas strategies that enhance stress do not seem to be associated with sleep bruxism. Findings do not admit the conclusion that there is a causal association of maladaptive coping and bruxism. However, they support the approach of a multidisciplinary therapy involving psychological treatment.*

Key words: sleep bruxism, stress, coping, maladaptive coping strategies

Introduction

Sleep bruxism can be defined as involuntary grinding or clenching of the teeth during sleep (Bader & Lavigne, 2000). It can cause abrasive tooth wear, hypermobility of teeth, tooth hypersensitivity, hypertrophy of masticatory muscles, and pain in masticatory muscle or joint (Kato, Dal-Fabbro, & Lavigne, 2003; Mealiea & McGlynn, 1987).

Due to different diagnostic criteria, reports referring to the prevalence of sleep bruxism differ widely between authors. Estimates concerning pathological sleep bruxism cover a range between 5% and 30% (Glaros, 1981; Granada & Hicks, 2003; Lavigne & Montplaisir, 1994; Ohayon, Li, & Guilleminault, 2001). There are no gender differences in sleep bruxism, and the age distribution points at a larger occurrence of bruxism in individuals from 20 to 45 years with a decline in older people (Bader & Lavigne, 2000).

Up to now, occlusal splint therapy, which consists of an intraoral appliance, is the main therapeutical approach for bruxism (Dao & Lavigne, 1998; Kato et al., 2003). However, there is an ongoing discussion concerning its effectivity (e.g., Dube, Rompré, Manzini, Guitard, de Grandmont, & Lavigne, 2004; van der Zaag, Lobbezoo, Wicks, Visscher, Hamburger, & Naeije, 2005).

Different etiological factors have been discussed for sleep bruxism, e.g., occlusal interferences (Clark, Tsukiyama, Baba, & Watanabe, 1999; Ramfjord, 1961), transient sleep arousal episodes (Kato, Rompré, Montplaisir, Sessle, & Lavigne, 2001; Macaluso, Guerra, Di Giovanni, Boselli, Parrino, & Terzano, 1998), altered expression of striatal dopamine D2 receptors (Lavigne, Soucy, Lobbezoo, Manzini, Blanchet, & Montplaisir, 2001; Lobbezoo, Soucy, Hartman, Montplaisir, & Lavigne, 1997), personality traits (Bader & Lavigne, 2000; Molina & dos Santos, 2002), and psychological stress (Ahlberg et al., 2002; Ohayon et al., 2001). Although in the past occlusal interferences have been considered the main causative factor for sleep bruxism, various research groups did not find any reliable evidence that occlusal differences can cause nocturnal bruxism (e.g., Clark et al., 1999;

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Manfredini, Landi, Tognini, Montagnani, & Bosco, 2004). Nowadays, there is a consensus about a multifactorial etiology (Lobbezoo & Naeije, 2001). However, it still remains unclear how these factors interact.

Stress as a causal agent of sleep bruxism was investigated in several studies. In an epidemiological study on British, German, and Italian population samples, highly stressful life was positively associated with self-reported sleep bruxism (Ohayon et al., 2001). In another investigation on 1,339 employees of a Finnish broadcasting company, frequent sleep bruxism was significantly associated with severe stress experiences (Ahlberg et al., 2002). Two further studies demonstrated an association between sleep bruxism and Type A behavior, which is related to stressful life (Hicks & Chancellor, 1987; Pingitore, Chrobak, & Petrie, 1991). A psychometric study (Manfredini, Landi, Romagnoli, & Bosco, 2004) demonstrated a significantly higher stress sensitivity in bruxers compared to healthy controls. Studies on urinary catecholamines in sleep bruxers, indicating stressful states, detected a significant association of urinary epinephrine and dopamine with sleep bruxism in children (Vanderas, Menenakou, Kouimtzis, & Papagiannoulis, 1999), as well as a positive relationship between increased urinary epinephrine and high levels of sleep masseter muscle activity (Clark, Rugh, & Handelman, 1980).

In contrast to these findings, there was no relationship between nocturnal measured extent of sleep bruxism and self-reported stress (Pierce, Chrisman, Bennett, & Close, 1995; Watanabe, Ichikawa, & Clark, 2003). In another study (Monteiro da Silva, Oakley, Hemmings, Newman, & Watkins, 1997), no significant differences between sleep bruxers and controls with respect to perceived stress during the previous year were found.

Altogether, findings suggest an association between stress and nocturnal bruxism, although enhanced sleep bruxism as an immediate consequence of diurnal stress could not be proved. It remains an open question whether bruxism is associated with maladaptive dispositional coping styles. Following the transactional model of stress and coping (Lazarus & Folkman, 1984), stress depends on the impact of an external stressor, which is mediated by the appraisal of the stressor (primary appraisal) and the appraisal of the resources to handle the situation (secondary appraisal). Coping is the actual strategy of an individual to deal with the stressor. Dispositional coping styles are generalized ways of behaving in stressful situations, stable across time and circumstances.

The aim of the present study was to investigate whether bruxers, compared to a group of non-bruxing individuals, apply maladaptive coping strategies, implicating reduced functional coping and/or coping strategies that augment stress. As coping styles are reported to differ with respect to gender (Endler &

Parker, 1990; Weyers, Ising, Reuter, & Janke, 2005), a possible interaction of bruxism and gender should be controlled. Maladaptive coping strategies in bruxers could have consequences for a psychological treatment approach like stress-reduction behavioral counseling, which is still rare in the therapy of bruxism.

Method

Participants

The sample consisted of 75 sleep bruxers and 38 non-bruxing German native speakers. Bruxers were recruited for a clinical study (stress reduction counseling vs. oral splint); non-bruxers were recruited as a control group for psychometric investigation. Both groups responded to a newspaper announcement in which patients suffering from bruxism were asked to participate in an intervention study (stress reduction counseling vs. intraoral appliance). In a simultaneous announcement, non-bruxing individuals were asked to participate in a psychometric study concerning bruxism. All participants received a cost-free, detailed dental examination and professional teeth-cleaning.

The dental examination, as well as an anamnestic interview, verified respectively, excluded criteria A and B of the diagnosis "sleep bruxism" of the American Academy of Sleep Medicine (2001). Additionally, participants were asked for complaints of sleeping partners concerning nocturnal grinding sounds, as well as for discomfort of jaw muscles in the morning to verify *current* bruxism. Subjects were considered "non-bruxing" when, in the clinical examination, none of the above criteria were fulfilled. The following exclusion criteria were defined: use of psychotropic drugs, drug abuse, alcohol abuse (more than 1 l beer or corresponding quantity of other alcoholic drink daily), age over 40 or below 20 years.

The sociodemographic characteristics of the two groups are displayed in Table 1. The groups did not differ with respect to age, sex, and education (t-test, resp., chi^2-test).

Table 1. *Sociodemographic Characteristics of the Study Sample*

		Bruxers ($n = 75$)	Non-Bruxers ($n = 38$)
Age	Mean (*SD*)	29.3 (4.7)	26.8 (5.1)
Sex			
Male	*n* (%)	26 (34.7%)	15 (39.5%)
Female	*n* (%)	49 (65.3%)	23 (60.5%)
Years of education			
10 years school	*n* (%)	4 (5.3%)	2 (5.3%)
13 years school	*n* (%)	48 (64.0%)	30 (78.9%)
18 years/university	*n* (%)	23 (30.7%)	6 (15.8%)

Note. Groups are matched with respect to age, gender, and education (corresponding to the German education system).

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Dependent Variables

The SVF78 (Stress Coping Questionnaire; Janke, Erdmann, & Kallus, 2002) is the short version of a German coping questionnaire. It consists of 78 items (5 point response scale, 0–4) asking for different strategies in response to stress. The basic assumption of the questionnaire is that these strategies are relatively situation-invariant traits which are thought to be stable over time.

The items are summarized in 13 subscales: 1 (self-aggrandizement by comparison with others), 2 (denial of guilt), 3 (distraction), 4 (substitute gratification), 5 (situation control), 6 (reaction control), 7 (positive self-instructions), 8 (need for social support), 9 (avoidance), 10 (escape), 11 (rumination), 12 (resignation), and 13 (self-blame).

Subscales 1 to 8 are merged into the major scale "positive coping strategies." They represent strategies that are appropriate to reduce stress. Subscales 9 to 13 are merged into "negative coping strategies," which are prone to augment stress. The SVF78 is the most established and most frequently applied coping inventory in Germany (Weyers et al., 2005). It is the only well-evaluated instrument, investigating general coping styles as a stable trait in German language (Ising, Weyers, Reuter, & Janke, 2006). It is provided with good reliability of the 13 subscales: Cronbach's alpha ranges from 0.77 to 0.94, the 4-week retest reliability is between 0.62 and 0.96. The major subscales were proved to have a Cronbach's alpha of 0.89 (positive coping strategies), respectively, 0.94 (negative coping strategies). Validity of the SVF78 has been proved by factorial analysis and correlation with divergent and convergent traits (Ising, Weyers, Janke, & Erdmann, 2001; Janke et al., 2002). Participants completed the questionnaire sitting in a quiet room after dental examination and exclusion criteria were checked.

Statistical Analyses

For statistical data analyses, the statistics software SPSS (version 12.0.1, SPSS Software, Munich, Germany) was used. For positive and negative coping strategies as major scales, two-factorial analyses of variance were applied with the two-fold between factor "bruxism" (bruxers vs. non-bruxers) and the two-fold between factor "sex" to control the influence of gender.

In addition to that, in case of a significant main effect "bruxism," a post hoc power analysis was performed to insure that the actual test power was sufficient.

Multivariate analyses of variance with all corresponding subscales as dependent variables were performed to find out which of the subscales predominantly contribute to an effect. A significance level of α $p < .05$ was defined.

Table 2. *Means and Standard Deviations (SD) of Positive and Negative Coping Strategies*

	Bruxers	Non-Bruxers	Total
Positive coping strategies (SVF78)			
Female	10.64 (2.02)	12.40 (1.75)	11.20 (2.09)
Male	10.94 (2.33)	12.27 (2.33)	11.41 (2.39)
Total	10.75 (2.12)	12.35 (1.97)	11.29 (2.20)
Negative coping strategies (SVF78)			
Female	8.70 (2.86)	8.87 (2.65)	8.75 (2.78)
Male	7.65 (2.72)	6.16 (2.95)	7.11 (2.86)
Total	8.34 (2.84)	7.80 (3.04)	8.16 (2.91)

Results

Positive Coping Strategies

The analysis of variance revealed a highly significant main effect "bruxism" with reduced positive coping strategies of bruxers compared to non-bruxers ($F(1/109) = 12.9$; $p < .001$). There was neither a gender effect nor an interaction of "bruxism" and "sex."

The post hoc power analysis revealed a high test power of 0.952, based on an effect size of eta$^2 = 0.106$ (Cohen's $f = .344$) and the total sample size of $N = 113$. The critical F-value is $F(1/109) = 3.93$ and Lambda is 13.395.

The multivariate analysis of variance on the subscales corresponding to positive coping strategies revealed a contribution to the effect of "self-aggrandizement by comparison with others" ($F(1/109) = 6.0$; $p < .05$), "distraction" ($F(1/109) = 4.6$; $p < .05$), and, mainly, "reaction control" ($F(1/109) = 15.0$; $p < .001$) as well as "positive self-instruction" ($F(1/109) = 11.4$; $p < .001$).

Negative Coping Strategies

For negative coping strategies, "bruxism" did not reach the level of significance, whereas males showed significantly less negative coping than females ($F(1/109) = 10.7$; $p < .001$). Males predominantly reported less "rumination" ($F(1/109) = 8.1$; $p < .01$), less "self-blame" ($F(1/109) = 9.7$; $p < .01$) as well as less "resignation" ($F(1/109) = 5.9$; $p < .05$). The interaction of "bruxism" and "sex" did not become significant.

Means and standard deviations are presented in Table 2.

Conclusion

The purpose of the study was to investigate the presence of possible maladaptive coping strategies in bruxers compared to non-bruxing controls, considering gender as potentially mediating factor.

Bruxers had significantly less positive coping strategies, which points to a dispositional maladaptive coping style in bruxers. There are reduced

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functional strategies, predominantly "reaction control" and "positive self-instruction," as well as "self-aggrandizement by comparison with others" and "distraction." This means that they experience a loss of control referring to their own stress response, and they do not manage to encourage themselves. Comparing themselves to others, bruxers have a lack of confidence in their own resources. Furthermore, they are deficient in distracting themselves from stressful situations and turning to recreational activities instead. Analysis of negative coping strategies did not reveal any significant difference between the groups. Accordingly, bruxers do not use enhanced dysfunctional strategies that lead to augmented stress, for instance, avoidance or escape. There were no interactions of gender and bruxism, but a significant main effect of gender with less negative coping strategies of males. This is according to previous findings, demonstrating that women have more negative coping strategies than men (Weyers et al., 2005), and, respectively, that men show more problem-orienting coping than women (Endler & Parker, 1990; Nolen-Hoeksema, Grayson, & Larson, 1999).

The present study has several limitations that have to be taken into account when data are interpreted. First, participants were selected on the basis of a thorough dental examination. Clinical selection criteria, including the detection of abnormal tooth wear, does not consider current bruxism. However, the sleeping partner's report of grinding sounds, as well as the self-report of muscle fatigue or pain on awakening, should give a hint toward ongoing disorder. The suitability of polysomnographic recordings as research diagnostic criteria for sleep bruxism has been proven when distinguishing between sleep bruxers and an adequate control group (Lavigne, Rompré, & Montplaisir, 1996). This method is, however, of limited applicability due to its extensive technical complexity. This disadvantage is seen in the fact that only a relatively small number of patients were included in these studies.

Second, the study sample was not representative as selection was due to the defined exclusion criteria. This was especially true concerning the defined age and the absence of drug or alcohol consumption. Otherwise, it was chosen for an age bracket in which bruxism typically occurs; there is a decline of bruxism with older age. The intake of psychotropic drugs and alcohol has been found to influence the occurrence of bruxism; therefore, this factor was excluded. The whole sample had a relatively high level of education. This might be a selection bias as well-educated subjects are possibly more interested to take part in university studies, but that bruxism typically occurs in well-educated individuals is not likely. However, there are no studies concerning this issue, and education of participants is not reported in most studies of bruxism.

The groups were simultaneously recruited, but bruxers had another motive to participate in the study—

they looked for treatment. This also could have led to a selection bias. On the other hand, it should not be expected that this circumstance may have led to a significantly differential scoring behavior when completing the questionnaire. It is difficult to exclude or control a selection bias when recruiting bruxers and non-bruxers. The motivation of bruxers to participate in a study on bruxism will always be to know more about the disease and to find a way to handle it. A solution could be to recruit subjects without any information about the nature of the study, but this is problematic from an ethics point of view.

Furthermore, the sample size of the recruited groups was not equal. This was due to economical reasons, as all subjects underwent a complex dental examination that could not be afforded for a greater sample of non-bruxers. However, the applied statistical analyses are able to consider differing sample sizes.

Another critical point was the missing prospective design. Coping strategies were assessed after occurrence of bruxism, which does not allow interpreting a causal relationship. Maladaptive coping possibly contributes to the etiology of bruxism. On the other hand, bruxism could lead to maladaptive coping strategies because of the chronic dental or myofascial impact and a possible subsequent helplessness. To investigate a causal relationship of maladaptive coping and bruxism, further studies could assess coping strategies, and then, in a longitudinal approach, measure changes in bruxism activity depending on stressful events.

The last issue was the question of clinical significance. The given statistical significance of the reported effect does not mean that the effect is relevant from a clinical point of view. The effect size, however, is considerable, and the mean difference between the groups is about 1.5 standard deviations. Bruxers show 13% reduced positive coping strategies compared to non-bruxers. This might be of clinical relevance.

Recapitulating, the present study is an economic approach which demonstrates enhanced maladaptive coping strategies in bruxers compared to non-bruxing individuals. Although a causal relationship cannot be concluded, results support the effort of complex and expensive studies referring to psychotherapy in bruxism that still are rare. Standard therapy consists of an occlusal splint. However, it's still an on-going discussion as to whether its only function is to prevent dental injuries.

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